

2. Liver Fluke
(*Fasciola hepatica*)

- Phylum : Platyhelminthes
- Class : Trematoda
- Order : Digenea

Fasciola hepatica is an *endoparasite* with a leaf-like, dorsoventrally flattened body. It is commonly known as *liver-fluke*.

It is a flattened worm. Hence it is included in the phylum *Platyhelminthes* and class *Trematoda*.

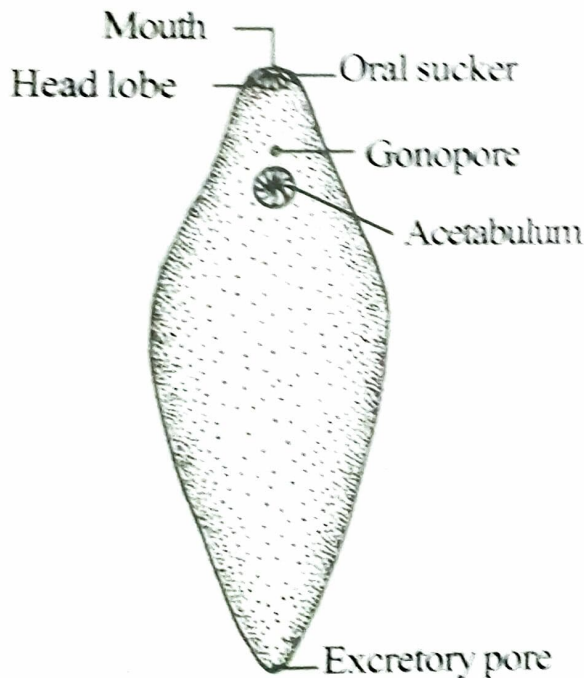


Fig.7.27: *Fasciola hepatica*: ventral view.

The liver fluke is an endoparasite. It lives inside the *bile-duct* of liver in sheep, goats and cattle. It causes a disease called *liver-rot* in sheep.

It is conical in shape and flat-like a leaf. It is about 25 mm long and about 15mm in breadth.

It is narrow at the anterior end, broad in the middle and tapers towards the posterior end.

The entire body is covered by *cuticle*.

At the anterior end there is a triangular projection, the *head-lobe*.

It has two suckers, an *oral sucker* or *anterior sucker* at the tip of the head lobe and a *ventral sucker* or *acetabulum* behind the head lobe, on the ventral side.

The oral sucker encloses the mouth and the ventral sucker has no aperture. The suckers help in the attachment of the parasite to the host.

Between the two suckers there is a *genital opening* or *gonopore*. At about one third of the length from the anterior end, in the mid-dorsal line, there is a minute aperture, the *opening of Laurer's canal*.

An *excretory pore* is present at the hind end.

Body Wall

The body wall of liver fluke is *triploblastic*. It is covered with a tough *cuticle*. The cuticle protects the animal from the digestive juice of the host. It bears a number of backwardly directed *spines* or *spinnules* which help to anchor the fluke to the bile-duct of the host.

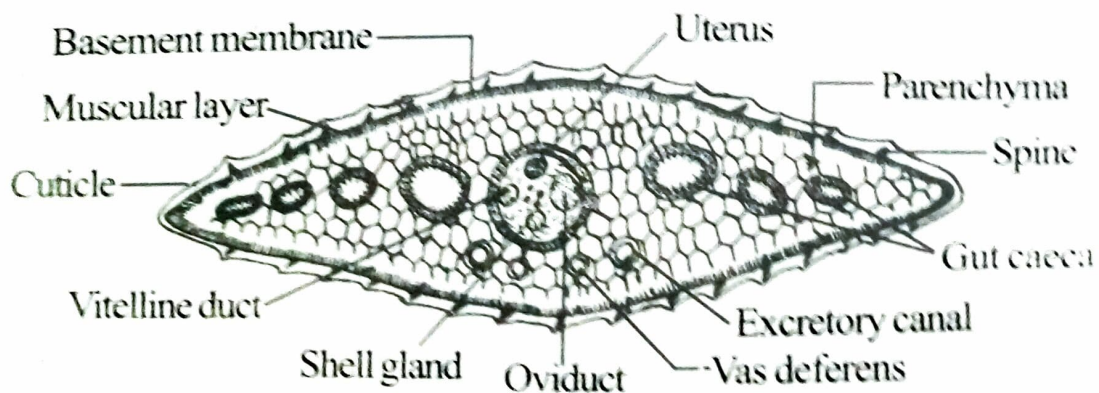


Fig.7.28: *Fasciola hepatica*: Transverse section.

Below the cuticle a thin **basement membrane** is present. Below the basement membrane is a muscular layer formed of **circular** and **longitudinal muscles**. The muscle fibres are very smooth. The space present in between the muscular layer and the inner organ is filled with **parenchyma**.

Digestive System

The digestive system is very simple. It is formed of a **mouth**, the **pharynx**, **oesophagus** and the **intestine**.

The **mouth** is sub-ventral in position. It is surrounded by the **oral sucker**. It leads into a funnel-shaped muscular **pharynx**.

The pharynx is surrounded with **pharyngeal glands**. The lumen of the pharynx is very narrow, which leads into a short, narrow **oesophagus**.

The oesophagus is followed by the **intestine**. The intestine soon after its origin divides into two branches called **caeca**. Each caecum runs upto the posterior end where it ends blindly. Each caecum is divided into a number of branching **diverticula**. The **anus** is absent.

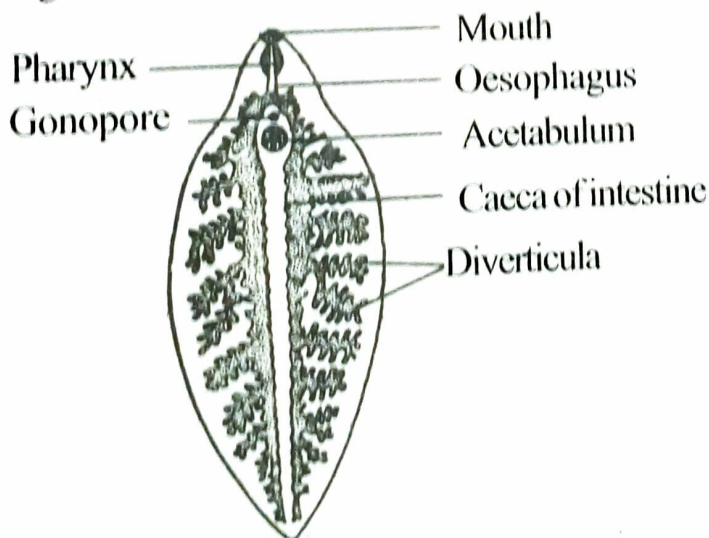


Fig. 7.29: *Fasciola hepatica*; Digestive system.

The liver fluke feeds on the blood and bile of the host. It sucks the liquid food by the muscular pharynx. As the food is already in the digested state and fit for absorption, the diges-

tive glands are completely absent. The food is absorbed in intestine. The branches of diverticula transport the digested food to the different parts of the body along the parenchyma.

Respiratory System

Liver fluke has no special respiratory organs. The respiration is of **anaerobic** type. That is, the stored glycogen in the body is broken up into CO_2 and volatile fatty acids by the process of **glycolysis**. The CO_2 diffuses out through the body wall. The fatty acids are excreted by the excretory organs. The energy produced during glycolysis is enough to maintain the various activities of the animal.

Excretory System

The excretory system in liver fluke is formed of **protonephridia**. It has no internal opening. It consists of a median longitudinal **excretory canal**. The canal opens to the outside at the posterior end of the animal by an **excretory pore**.

The excretory canal gives out many branches. Each branch ends in a cell called **flame cell**.

Each flame cell is formed of a **single cell**. It has an elastic thin wall with a **nucleus** and a **cavity**. The cavity contains a **bundle of cilia**. The cilia show flickering movement like a flame; hence the name **flame cell**. The surface is produced into **pseudopodia**.

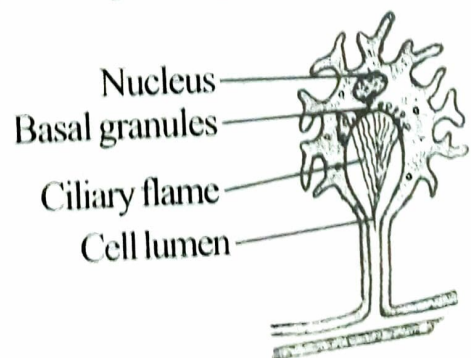


Fig. 7.30: Flame cell.

The liquid wastes are absorbed from the surrounding tissues by the flame cells. By the

movement of cilia, the wastes are sent out through the excretory pore.

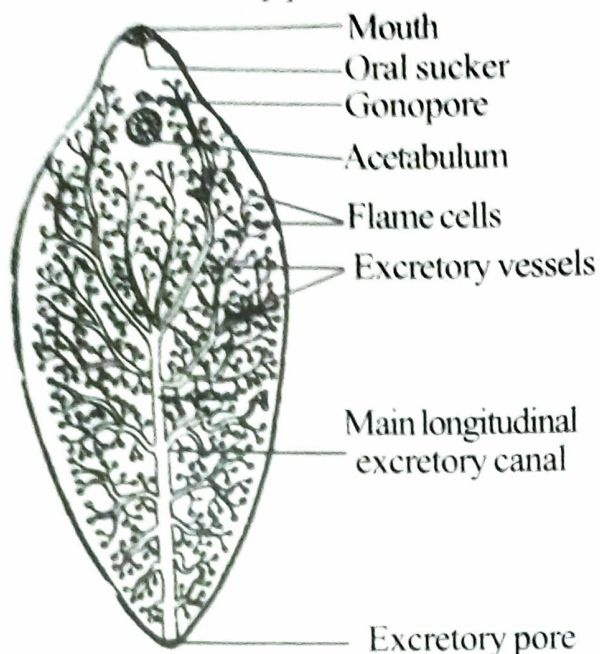


Fig. 7.31: *Fasciola*; Excretory organs.

Nervous System

The nervous system is formed of a *nerve ring* and *nerve cords*. The nerve ring surrounds the *oesophagus*. It consists of three *ganglia* (nerve thickening). Two are dorso-lateral called *cerebral ganglia* and one is ventral in position.

Anteriorly small nerves arise from the ganglia and supply the *head lobe* and the *oral sucker*.

Posteriorly, three pairs of *nerve cords* arise from the ganglia. They are a dorsal pair, a ventral pair and a lateral pair. These nerve cords are connected by *transverse commissures*.

The lateral cords are well developed; they extend upto the posterior end of the body, giving off branches to the different parts of the body.

Reproductive System

Liver fluke is *hermaphrodite*. Both *male* and *female* reproductive organs are present in the same animal. It contains complicated reproductive organs. The male and female geni-

tal ducts open into a common chamber, the *genital atrium*. The genital atrium opens outside through the common *genital aperture*.

Male Reproductive System

It consists of two *testes*. They are tubular and highly branched. A *vas deferens* arises from each testis. The two *vasa deferentia* run forward and join to form a median bag-like structure the *seminal vesicle*.

The sperms produced by the *testes* are stored in the seminal vesicle. The seminal vesicle leads into a narrow tube, the *ejaculatory duct*. The ejaculatory duct opens into a muscular tube called *penis*. It opens into the genital atrium by the male *genital aperture*.

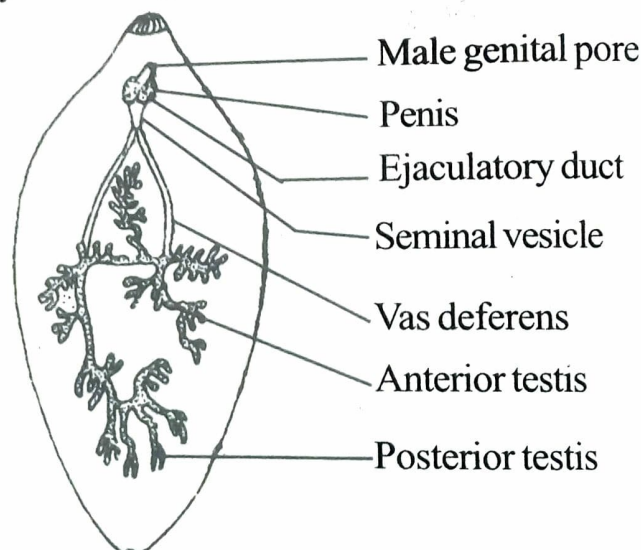


Fig. 7.32: *Fasciola*; Male reproductive system.

Female Reproductive System

The female reproductive system is formed of a single *ovary*. It is tubular and branched. It lies in the middle of the body in front of the testes. An *oviduct* arises from the ovary. It runs forward and joins the *vitelline duct*.

There are numerous small rounded *yolk glands* or *vitellaria* on the sides of the body. These glands secrete yolk and the shell.

A minute duct known as *yolk duct* arises from each yolk gland. All yolk ducts unite into an *anterior longitudinal vitelline duct* and

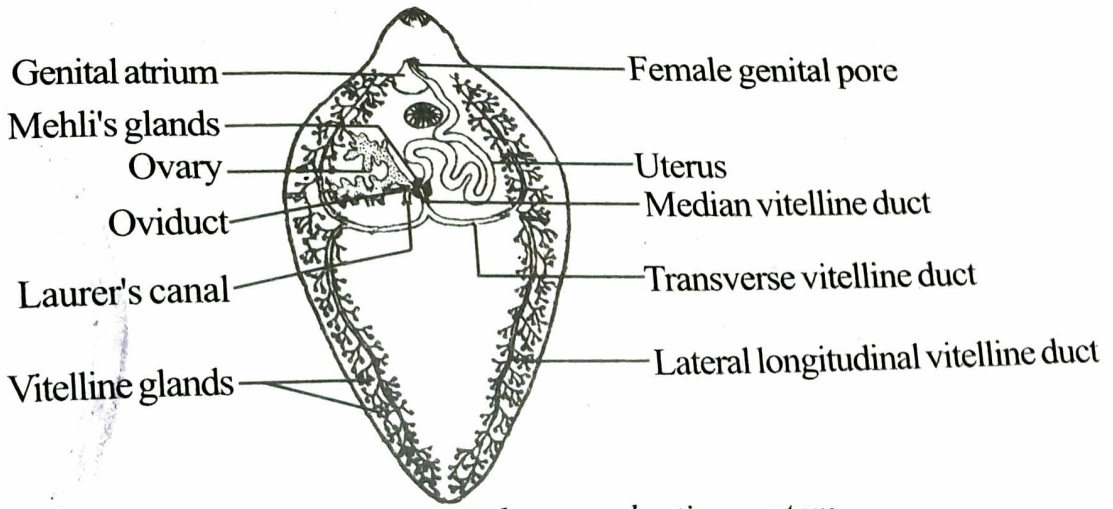


Fig.7.33: Fasciola-Female reproductive system.

a **posterior longitudinal vitelline duct** on each side.

The two longitudinal ducts join to form a **transverse vitelline duct**.

The transverse vitelline ducts of the two sides run inward and join to form a **median vitelline duct** which runs forward and joins the oviduct.

The junction of median vitelline duct and the oviduct is slightly dilated to form an ootype. Around the ootype there is a mass of unicellular **Mehli's glands** or **shell glands**. The secretion of Mehli's glands lubricates the passage of eggs in the uterus. It also activates the sperm and hardens the egg shell.

From the ootype arises a large duct called **ovo-vitelline duct** or **uterus**. The uterus runs forwards as a coiled tube and opens to the exterior through the female genital pore close to the male genital pore.

From the ootype arises another canal known as **Laurer's canal**. It runs vertically upwards and opens on the mid-dorsal surface.

During copulation, the sperms are received from the other fluke through this canal. So it is also termed **copulation canal**.

Life History

Liver fluke is a **digenic parasite**. It completes its life cycle in two hosts, namely **sheep**

and a **snail** called *Limnaea truncatula*. Sheep is the **primary host** and snail is the **secondary host**. Its development is **indirect** since there are larval stages.

Capsule

Fertilization is **internal**. It occurs in the **ootype**. The fertilized egg is surrounded by many **yolk cells**. The egg and yolk cells are surrounded by a shell. The complete structure is called **capsule**. The capsule is **oval** in shape and it has a **lid** or **operculum** on one side.

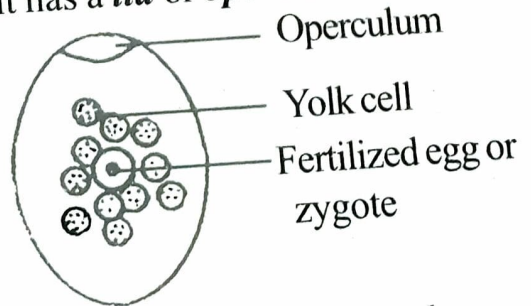


Fig.7.34: A capsule.

The capsules pass into the uterus. From there, they pass into the bile duct of sheep through the **gonopore**. Then they reach the intestine and pass out through the faeces. When the eggs are laid in dry places, they die out. But when they are laid in moist places, the operculum opens and a larva is released. This larva is called **miracidium larva**.

Miracidium Larva

Miracidium is hatched from the **capsules**. It has the following salient features:

Chap. 7: PLATYHELMINTHES

1. It is a free swimming larva living in ponds.
2. It lives for 24 hours.
3. It is **microscopic**.
4. It is **conical** in shape.
5. The anterior end is **broad** and the posterior end is **narrow**.

13. The larva has two **protonephridia**. Each protonephridium has a flame cell and a long duct. The duct opens to the outside by a **nephridiopore**.

14. The interior of the larva is filled with groups of specialized cells called **germ cells**.

15. It does not feed.

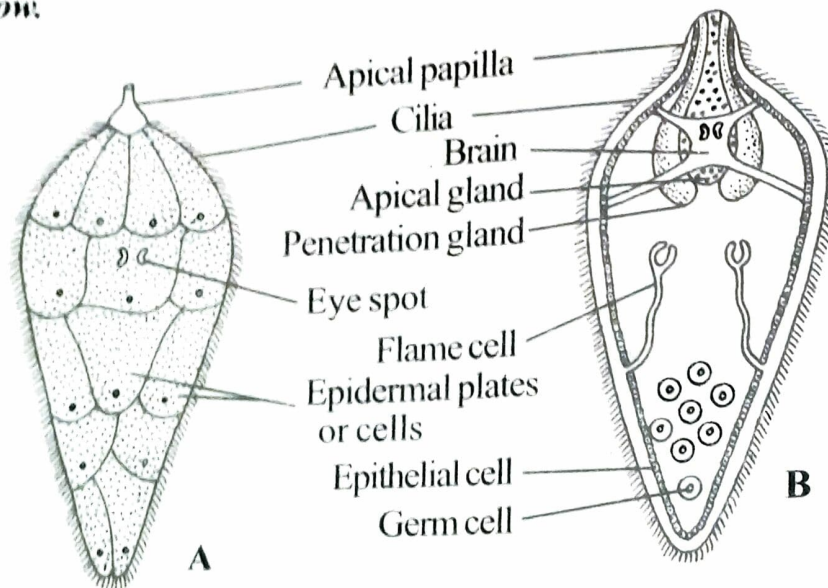


Fig. 7.35: Miracidium larva; A Surface view, B Inner view.

6. The anterior end has a small projection called **apical papilla**.
7. The body is covered by **cilia**.
8. The body wall is covered by a layer of **epidermal plates**. There are twenty-one plates arranged in five rows. The number of plates in each row is as follows: I row has 6 plates; II row has 6 plates; III row has 3; IV row has 4 and V row has 2.
9. At the anterior end inside the body, there is a sac-like gland called **apical gland**. It opens at the **apical papilla** by a duct.
10. Two sac-like glands are located on the sides of the apical gland. They are called **penetration glands**. They also open at the apical papilla.
11. A large **brain** or **apical ganglion** is situated near the anterior end.
12. Two eyes are located above the brain.

16. When it comes in contact with the snail *Limnaea truncatula*, the miracidium penetrates into the body of the snail. It reaches the digestive gland of the snail and gets transformed into another larva called **sporocyst**.

Sporocyst

Sporocyst develops from **miracidium**. It is the second larva of **liver fluke**. It has the following salient features:

1. It lives in the digestive glands of snail.
2. It is in the form of an elongated sac.
3. It is covered by **cuticle**.
4. It has two **protonephridia**. Each protonephridium has two flame cells; they open to the outside by a single **nephridiopore**.
5. The larva is filled with germ cells. The germ cells divide and redivide to form the next larva called **redia larva**. Each sporocyst can produce 5 to 8 larvae.

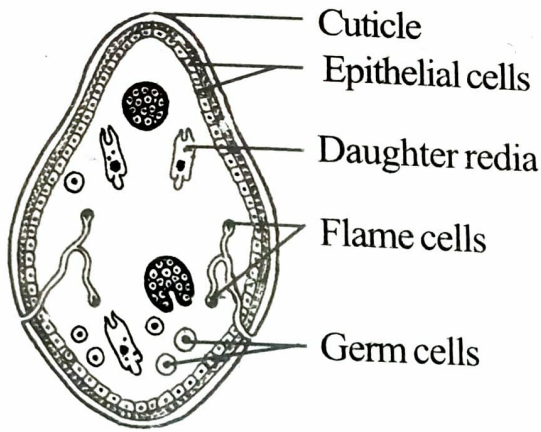


Fig.7.36: Sporocyst larva.

Redia Larva

Redia larva develops from the germ cells of **sporocyst**. The redia larva has the following salient features:

8. The mouth leads into a pharynx which ends in a sac-like intestine. The pharynx is surrounded by a group of **pharyngeal glands**.

9. Two protonephridia are located inside the body. Each protonephridium is formed of many **flame cells**. It opens to the outside by a nephridiopore.

10. The cavity of redia larva is filled with **germ cells**.

11. The germ cells of redia develop into **daughter redia**.

12. The germ cells of daughter redia develop into the next larva called **cercaria**. They come out through birth pore.

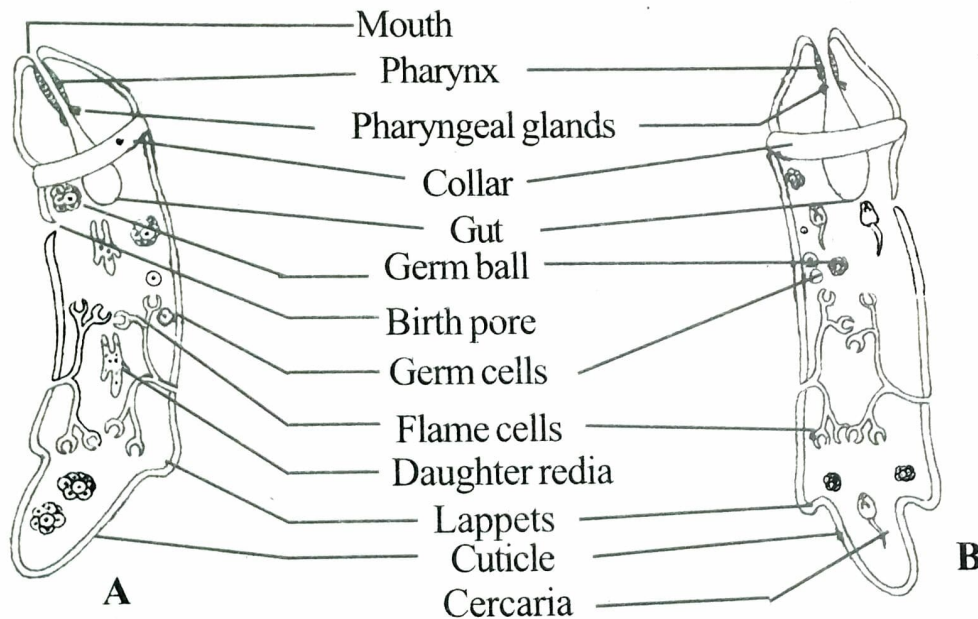


Fig.7.37: Redia larva. A. Redia with daughter redia, B. Redia with cercaria.

1. It lives in the digestive glands of the snail.
2. It is **cylindrical** in shape.
3. The body is covered by **cuticle**.
4. The anterior end has a **mouth**.
5. Behind the mouth, there is a muscular ring called **collar**.
6. Behind the collar, an opening called **birth pore** is located.
7. Near the posterior end a pair of projection is found. They are called **lappets**. They are used for locomotion.

Cercaria

The cercaria develops from the germ cells of redia. Each redia produces about twenty cercariae. The cercaria has the following salient features:

1. It is a free living larva.
2. It is tadpole-shaped.
3. It has an oval body and a tail.
4. The body is covered by **cuticle**.
5. It has two **suckers**, an **oral sucker** and the **acetabulum**.

Chap. 7 : PLATYHELMINTHES

6. It has a simple alimentary canal. It is formed of a mouth, the pharynx, the oesophagus and a 'U'-shaped intestine.

7. Numerous flame cells are located inside the body. The flame cells of each side are connected together by an **excretory tubule**. The excretory tubules of the two sides open into an **excretory vesicle**. From the vesicle an **excretory duct** arises. It runs into the tail and bifurcates. These bifurcations open to the outside by **nephridiopores**.

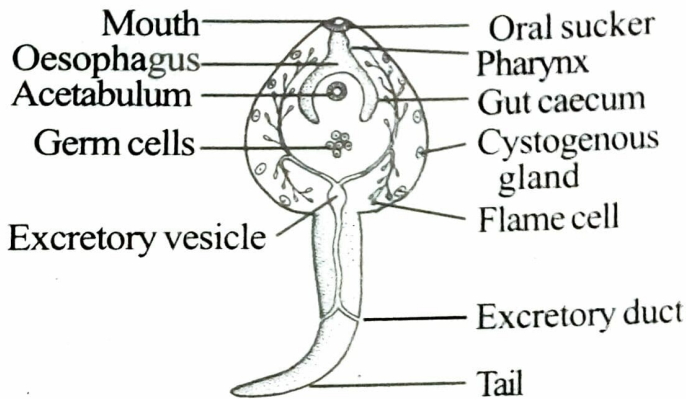


Fig.7.38: Cercaria larva.

8. The body wall contains many **cystogenous glands**.

9. The body cavity is filled with groups of **germ cells**.

10. The cercaria lives for three days and it is transformed into another larva called **metacercaria**.

Metacercaria

The cercaria loses its tail and the cystogenous gland secretes a cyst around the larva. The encysted cercaria is called **metacercaria**. It is found attached to the grasses.

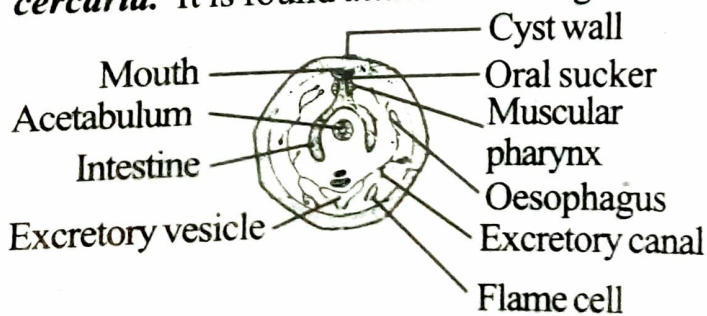


Fig.7.39: Metacercaria.

It has a round shape. Germ cells are located inside the metacercaria.

Infection

When a sheep eats the grass containing metacercaria, the larva enters the intestine. Here the cyst wall dissolves and the larva is liberated. It penetrates the wall of the intestine and enters the coelom. From the coelom it gets into the liver and grows into an adult fluke.

Alternation of Generations

The life history of liver fluke shows an alternation of generations. In *Fasciola*, the sexual reproduction alternates with a series of parthenogenetic reproductions. Miracidium larva is produced by sexual reproduction. **Redia** and **cercaria** are developed by **parthenogenesis** from the germ cells. Thus sexual reproduction alternates with parthenogenetic generation. This type of reproduction is called **heterogamy** or **heterogenesis**. The alternation of generations is also called **metagenesis**.

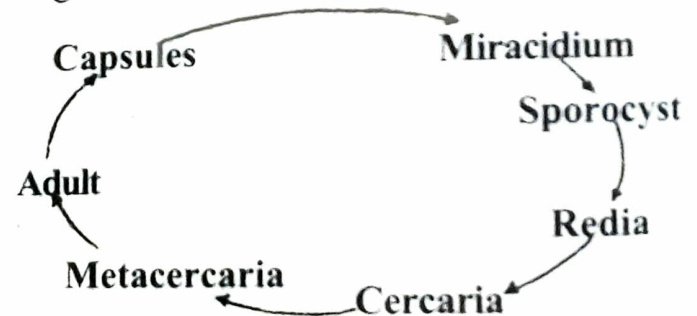


Fig.7.40: Fasciola; life cycle.

Pathogenesis

Liver fluke causes a disease called **liver rot**. It is characterized by **hepatitis**, **inflammation** and **gall stones**.

Prevention and Treatment

Liver fluke infection is prevented by the following methods:

1. Severely infected sheep must be killed.
2. The manure of infected sheep must be destroyed.
3. The snail population must be killed.

lowing drugs: *Carbon tetrachloride*, *hexachloroethane*, *filcin*, *emetine hydrochloride*, *tetrachloroethane*, etc.

3. Tape Worm

Phylum : *Platyhelminthes*

Class : *Cestoda*

Subclass : *Eucestoda*

Order : *Cyclophyllidea*

Taenia solium is an acoelomate, segmented, ribbon-shaped intestinal parasite in man. It is included in phylum *Platyhelminthes* and in class *Cestoda*.

Taenia solium is a common *endoparasite* found in the intestine of man who eats *pork* (flesh of pig) as his food.

The body is long, narrow, ribbon-shaped and dorsoventrally flattened. It reaches about 6 to 10 feet in length.

The body of the animal is divided into three regions, namely the *scolex*, the *neck* and the

occurs inside the cocoon. The development is *direct*. The cocoon contains many eggs. But one or two eggs develop into earthworms. The remaining eggs are used as food for the developing embryo. The young earthworm comes out by the rupture of the cocoon.

4. Leech **(*Hirudinaria granulosa*)**

Phylum : *Annelida*

Class : *Hirudinea*

Order : *Gnathobdellida*

Hirudinaria is commonly called *cattle leech*. It is a multicellular, bilaterally symmetrical, coelomate, triploblastic and metamerically segmented worm like animal. It is included in the phylum *Annelida* and the class *Hirudinea*.

It lives in ponds, tanks, lakes and rivers. It is an *ectoparasite* feeding on the blood of

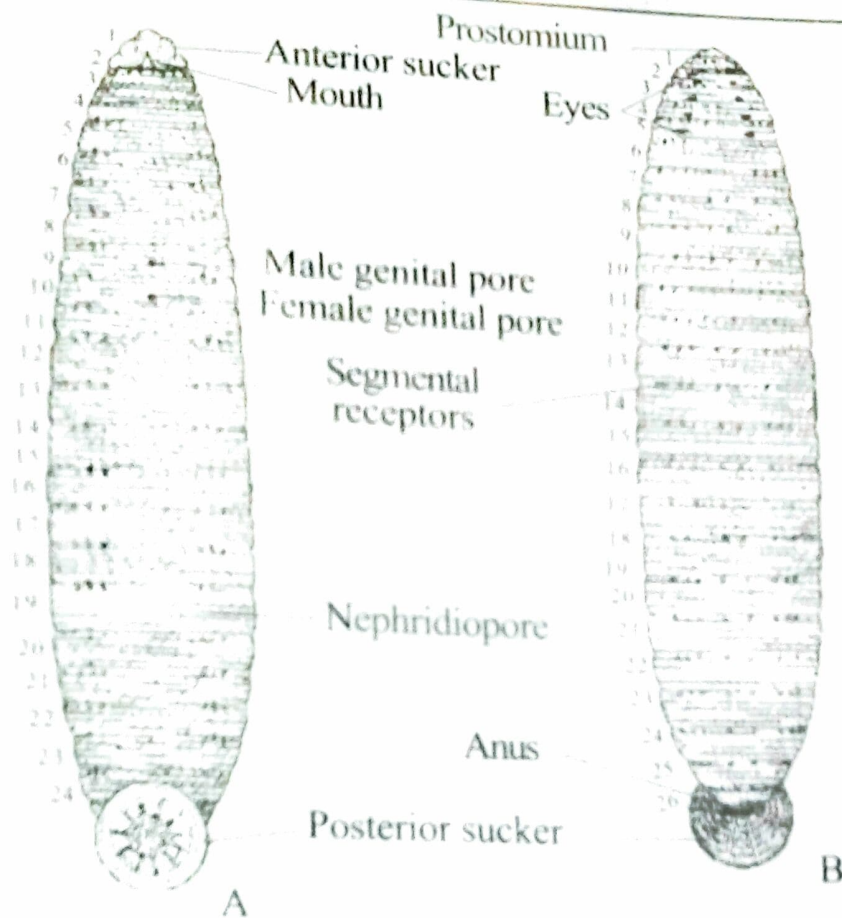


Fig.9.72: Leech A. Ventral view; B. Dorsal view.

cattle and man. As it feeds on blood, it is said to be **sanguivorous** in habit.

Leech is anteroposteriorly elongated. Its body is elastic in nature. It can be extended and contracted. In the contracted condition, it is **cylindrical**. In the extended condition it is **ribbon-shaped**. The dorsal surface is convex and the ventral surface is flat. Leeches grow to a length of 35cm. The dorsal surface is olive-green in colour and the ventral surface is yellowish in colour.

The body is metamERICALLY segmented. The segments are arranged one behind the other. It has 33 segments. The anterior end of leech has a lobe-like structure called **prostomium**.

Each segment is provided with a number of ring like structures called **annuli** (annulus = ring). Each segment in the middle region of the body contains 5 annuli. But the number of annuli in the anterior and posterior segments is

lesser. The number of annuli in each segment is given below :

1 st and 2 nd segments	- 1 annulus per segment
3 rd segment	- 2 annuli per segment
4 th to 6 th segments	- 3 annuli per segment
7 th to 22 nd segments	- 5 annuli per segment
23 rd segment	- 3 annuli per segment
24 th to 26 th segments	- 2 annuli per segment

Leech has two suckers. They are situated at the **anterior** and **posterior** ends. The sucker located at the anterior end is called **anterior sucker** or **oral sucker**. It is ventral in position occupying the first five segments. It is cup-shaped. The cavity of the cup is called **preoral chamber**. It leads into the mouth.

The sucker situated at the posterior end is called **posterior sucker** or **anal sucker**. It is also ventral in position. It is formed by the fusion of the last seven segments. It is disc-shaped and larger than the anterior suckers.

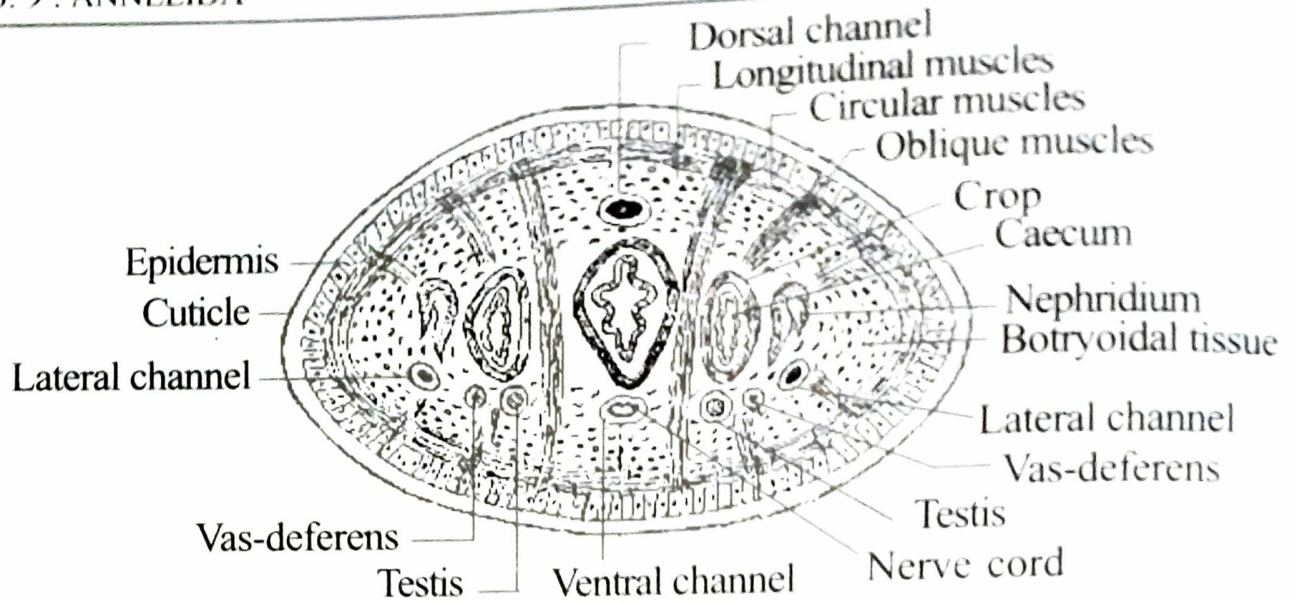


Fig.9.73: T.S. of Leech.

The suckers are used for the **attachment** of the leech to the host.

Leech has five pairs of eyes. They are situated in the anterior five segments, one pair in each segment.

Each segment bears a number of projections. These are called **receptors**. Receptors are of two types, namely **segmental receptors** and **annular receptors**. The segmental receptors are situated on the first annulus of each segment.

The dorsal side of each segment contains 4 pairs of segmental receptors and the ventral side contains 3 pairs of segmental receptors.

The annular receptors are located in each annulus. There are 36 pairs of annular receptors in each annulus, 18 pairs on the dorsal side and 18 pairs on the ventral side.

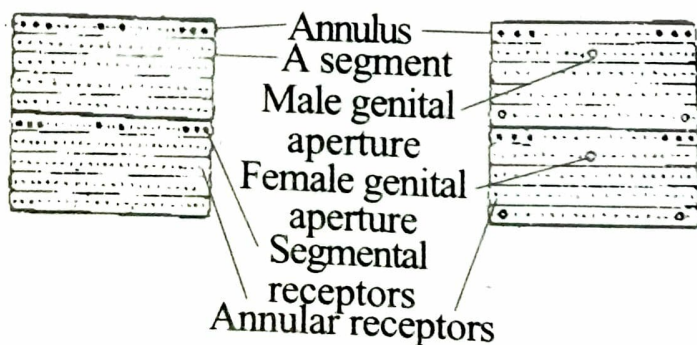


Fig.9.74: Leech; Segments enlarged.

Mouth: The mouth is situated in the middle of the anterior sucker.

Anus: The anal aperture lies dorsally at the base of the posterior sucker.

Nephridiopores: There are seventeen pairs of nephridiopores situated ventro-laterally in the last annuli of the 6th to 22nd segments.

Male genital aperture: It is a median aperture situated on the ventral side of the second annulus of the 10th segment.

Female genital aperture: It is also a median aperture situated on the ventral side of the second annulus of the 11th segment.

Body Wall

The body wall consists of 5 layers, namely the **cuticle**, the **epidermis**, **dermis**, the **muscular layer** and the **botryoidal tissue**.

1. Cuticle : It is the outer most, thin and transparent layer secreted by the underlying epidermis. It is shed from time to time.

2. Epidermis : The **epidermis** lies below the cuticle. It is formed of columnar cells. Many epidermal cells are glandular and secrete the mucous by which the body is kept moist.

3. Dermis : Below the epidermis lies the **dermis**. This layer is formed of connective tissue.

4. Botryoidal tissue : It lies beneath the longitudinal muscles. It fills the entire space lying around the gut.

Leech is a *coelomate* animal. But coelom is very much reduced and is represented by small cavity located around the gonads only. The original cavity lying between the body wall and the gut is filled with a special kind of tissue called *botryoidal tissue*.

Leech contains special longitudinal canals called *haemocoelic canals* filled with a blood-like fluid called *haemocoelic fluid*. This type of coelom is called *haemocoel*.

Locomotion

Leech moves in two ways. They are as follows :

1. *Looping or crawling movement* and
2. *Swimming movement*.

1. Looping or Crawling Movement

This type of movement is brought about by the contraction and relaxation of muscles. The two suckers serve for attachment during movement. The animal fixes its posterior sucker on the substratum.

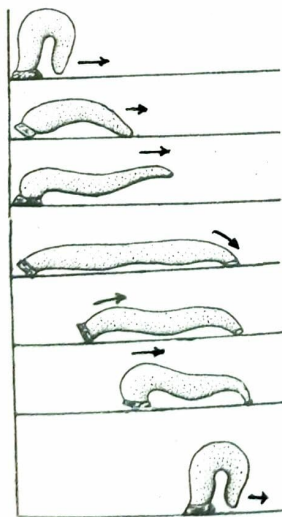


Fig.9.75: Leech; Stages in looping movement.

Then it gradually extends its body forward till it gets a firm hold on the surface with its anterior sucker. Having fixed its anterior sucker, it releases the posterior sucker and brings it

closer behind the anterior sucker. Here the posterior sucker is fixed. Then the anterior sucker is released and the movement is repeated.

2. Swimming Movement

The animal swims in water by undulating movements of the body.

Digestive System

The alimentary canal of leech is a straight tube extending from the mouth to the anus. It consists of the following parts :

1. Preoral Chamber and Mouth : The preoral chamber is a cup-like depression on the ventral side of the anterior sucker. Its roof is formed by a membrane-like velum bearing a triradiate mouth in the middle.

2. Buccal Cavity : The mouth leads into the buccal cavity. The buccal cavity is a short chamber lying behind the velum. The inner wall of the buccal cavity contains three jaws, one is *mid-dorsal* and the other two are *ventrolateral* in position. Each jaw is laterally compressed muscular cushion, covered with a fine cuticle. The cuticle is thickened at the edge to form a ridge bearing a row of minute *teeth*. Each jaw contains 42 to 54 button-like struc-

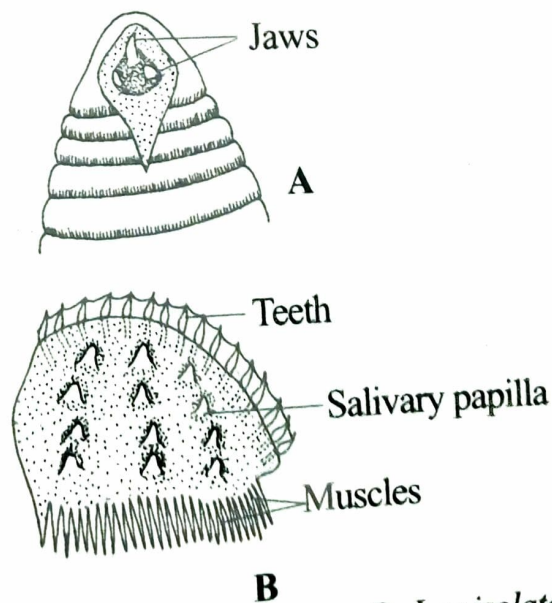


Fig.9.76: A. Mouth with jaws. B. Jaw isolated.

tures called *salivary papillae* which bear openings of salivary glands. The mouth and the buccal cavity occupy the first five segments.

3. Pharynx : The buccal cavity leads into a muscular chamber called *pharynx*. It extends from the 5th segment to the 8th segment. It is surrounded by large masses of unicellular glands called *salivary glands*, the ducts of which open on the salivary papillae. The salivary secretions contain *hirudin* which prevents the coagulation of blood.

4. Oesophagus : The oesophagus is short and narrow following the pharynx.

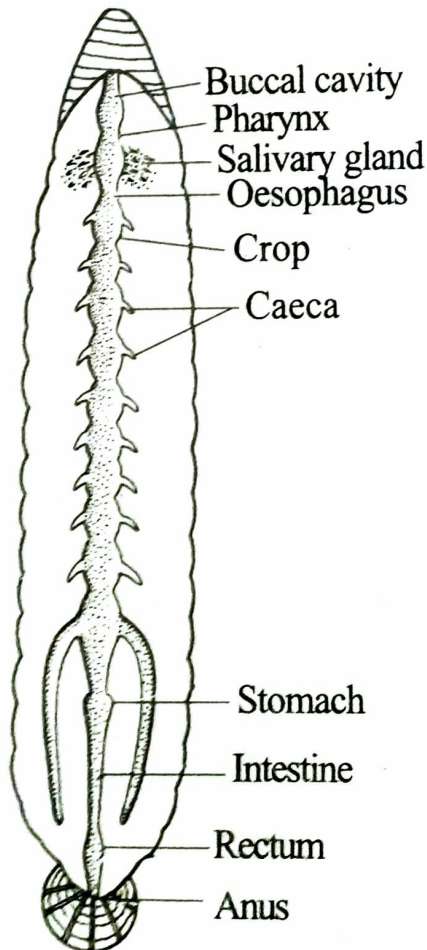


Fig.9.77: Leech; Alimentary canal.

5. Crop : It is an extensive chamber following the oesophagus and extending from the 9th to the 18th segment. It consists of ten chambers. The chambers communicate with each other through small apertures surrounded by *sphincters*. From each chamber arises a pair of *caeca* laterally. The anterior caeca are

smaller than the posterior caeca. The last pair of caeca is the largest extending upto the 22nd segment on either side of the intestine. The crop stores enormous quantity of blood.

6. Stomach : The last chamber of the crop ends in a funnel-shaped tube called *stomach*. It lies in the 19th segment.

7. Intestine : The stomach leads into the intestine. It is a thin-walled narrow tube. It lies in segments 19 to 22.

8. Rectum : The intestine ends in a region called *rectum* situated from the 23rd to the 26th segment.

9. Anus : The rectum opens to the outside by the *anus* on the 26th segment.

Food : The leech has a *sanguivorous habit*, sucking the blood of cattle and other domestic animals.

Feeding or Ingestion : The leech makes a wound with the jaws by making a rasping movement. The blood is sucked by the muscular *pharynx*. The salivary secretion is poured in the wound. The saliva contains an active substance called *hirudin* which prevents the coagulation of the blood.

Digestion : The blood sucked by the leech is stored up in the crop. The blood gets *haemolysed* in the crop. Then the blood is passed drop by drop into the stomach where it is digested slowly by the peptolytic enzyme.

Absorption : The digested blood is absorbed slowly by the intestine. Complete digestion and absorption of a full meal may take about a year or even more.

Respiration

There is no special respiratory organ in leech. The skin serves as a *respiratory organ*. The capillaries containing the haemocoelomic fluid extend in between the cells of the epidermis, act as a permeable membrane

the sub-

Intermediate host

Fig. 8.11: Cyclops.

7. The larva enters the *Cyclops*, living in water.

8. When man drinks water containing infected *Cyclops* the larva is released in the intestine of man.

9. From the intestine the larva enters the sub-cutaneous tissue.

10. The parasite causes itching, nausea, diarrhoea, vomiting, asthma, eosinophilia, etc.

11. It is controlled by removing the worms from the blister.

8. *Wuchereria bancrofti* (Filarial worm)

Phylum : Aschelminthes

Class : Nematoda

sm. The
in length.

The pos-
led.

ompletes
e primary
e host.

Sub class : *Phasmidia*

Order : *Filarioidea*

1. It is a **nematode parasite** causing **elephantiasis** in man.

2. It is commonly called **filarial worm**.

3. It is a **digenic** parasite. **Man** is the primary host and the **Culex** mosquito is the secondary host.

4. It lives in the lymph nodes and lymph vessels of man.

5. The sexes are separate and it exhibits **sexual dimorphism**. The male is smaller than the female. The male has a **curved** posterior end and a pair of **spicules**.

6. The male and the female are found coiled together.

7. It is **viviparous**, giving birth to larvae.

8. The larva is called **microfilaria**. It has a **stylet**.

9. The microfilaria passes from the lymph vessels into the blood vessels.

10. The larva comes to the peripheral blood vessels in the night.



Fig.8.12: Elephantiasis due to filaria.

11. When the **Culex** mosquito bites a man containing the larva, the larva enters the gut of mosquito.

12. In the gut, the larva moults twice and becomes another larva called **filariform larva**.

13. The filariform larva penetrates the gut and migrates to the muscles of the mosquito. Then it reaches the mouth parts.

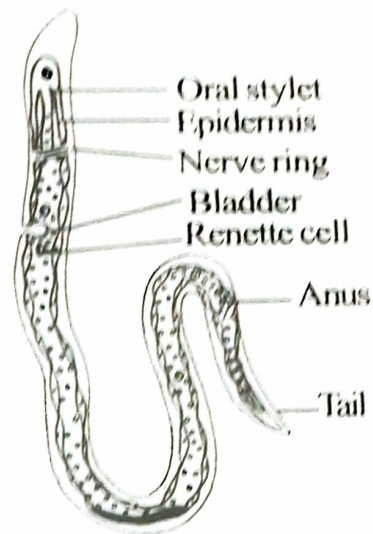


Fig.8.13: *Wuchereria*.

14. When the mosquito bites another man, the larva enters the blood of the man.

15. From the blood it goes to the **lymph vessels** and **lymph nodes**.

16. It causes the obstruction of the free flow of lymph. As a result, the lymph glands and lymph vessels of the affected parts (usually legs, arms, scrotum and mammae) are enlarged. This condition is known as **elephantiasis**. It is usually accompanied by fever, headache and mental depression.

17. It can be prevented by killing the vectors (mosquitoes). Mosquitoes are killed by spraying insecticides. The **compounds of antimony** and **arsenic** are satisfactory for the treatment of elephantiasis. **Heterazan** is another drug.

9. *Ancylostoma duodenale* (Hook worm)

Phylum : *Aschelminthes*

Class : *Nematoda*

Sub class : *Phasmidia*

Order : *Strongyloidea*

Ancylostoma is a human **nematode** parasite. It lives in the **intestine** of man. It is commonly known as **hook worm** because its anterior end bends backwards dorsally like a hook.

Liver fluke-infection is treated by the following drugs: *Carbon tetrachloride*, *hexachloroethane*, *filcin*, *emetine hydrochloride*, *tetrachloroethane*, etc.

3. Tape Worm

Phylum	: <i>Platyhelminthes</i>
Class	: <i>Cestoda</i>
Subclass	: <i>Eucestoda</i>
Order	: <i>Cyclophyllidea</i>

Taenia solium is an acoelomate, segmented, ribbon-shaped intestinal parasite in man. It is included in phylum *Platyhelminthes* and in class *Cestoda*.

Taenia solium is a common *endoparasite* found in the intestine of man who eats *pork* (flesh of pig) as his food.

The body is long, narrow, ribbon-shaped and dorsoventrally flattened. It reaches about 6 to 10 feet in length.

The body of the animal is divided into three regions, namely the *scolex*, the *neck* and the *strobila*.

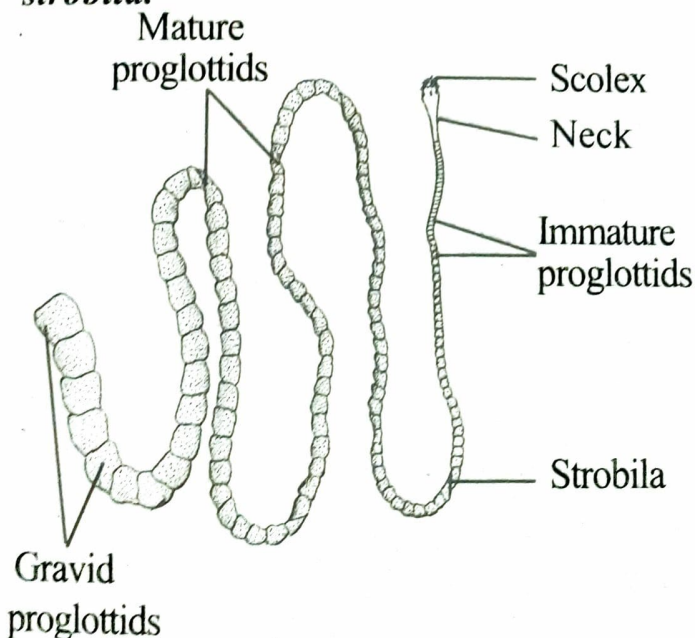


Fig.7.41: *Taenia solium*; External structure.

The *scolex* is a small knob-like structure, situated at the anterior end. It has the size of a pin-head. It possesses a small terminal cone called *rostellum* which is protrusible. Around the base of the rostellum, there is a double cir-

clet of chitinous *hooks*. The scolex has four *suckers*, which project from the surface. The suckers and hooks help to attach the animal to the intestine of the host.

The region immediately following the scolex is the *neck*. The neck is short, narrow and unsegmented. The neck is followed by the *strobila* which is formed of a chain of about 850 segments. Each segment is termed as *proglottid*. New segments are formed from the posterior part of the neck by budding.

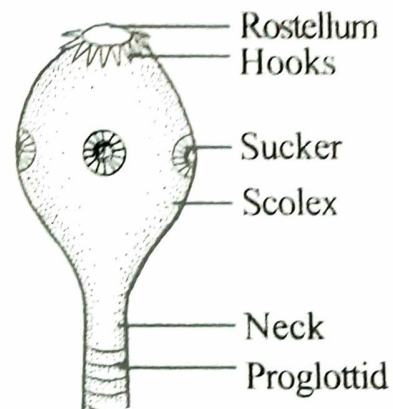


Fig.7.42: *Taenia*-Scolex.

The older segments are pushed away. So the new segments are located near the scolex and the old segments are located at the posterior end. The oldest segment is the last segment. The process of budding of the segment is termed *strobilization*.

The tape worm is a segmented animal showing a repetition of structures in each segment. As the new segments are formed from the anterior region, this type of segmentation is termed *pseudo-metamerism*.

Each proglottid contains a set of male and female reproductive organs and a part of the *nervous* and *excretory* systems. But the youngest segments lying near the neck are having no sex organs. They are termed as *immature proglottids*. The proglottids of the middle region are termed as *mature proglottids* which contain sex organs. The posterior most seg-

Chap. 7: PLATYHELMINTHES

ments are called *gravid* or *ripe proglottids* which contain fertilized eggs.

Body Wall

The body wall consists of a thin cuticle. It affords protection against the digestive juice of the host. Beneath the cuticle is a layer of *basement membrane*. Below the basement membrane are a layer of *circular* and *longitudinal* muscles. Below the muscular layer the interior of the proglottid is filled with *parenchyma*.

Feeding

There is no alimentary canal. Since the *Taenia* lives in the intestine of the host, it always gets an abundant supply of digested food. The digested food material is absorbed through the surface of the body.

Respiratory System

Taenia solium, like other endoparasites, lives in the intestine of man where the oxygen content is very low or absent. So respiration is *anaerobic* in which the energy is obtained by the break down of glycogen into CO_2 and fatty acids.

Excretory System

Excretion is carried out by *protonephridia*. The excretory system consists of 4 *longitudinal excretory vessels*. Of these four

vessels, two are *dorsal* and the other two are *ventral* in position. In the scolex these four vessels are joined by a ring vessel. At the end of each proglottid the two canals forming a pair are joined by transverse vessels.

At the last segment all the four vessels unite to form a *caudal vesicle* which opens outside by a common *excretory pore*. If the last segment is cut off, the longitudinal canals open by separate apertures. Minute branches arise from the longitudinal vessels, ending in *flame cells* found all over the parenchyma.

Nervous System

The nervous system in tape worm consists of a *nerve ring* with two small *ganglia* in the scolex. From the ganglia nerves arise *anteriorly* and *posteriorly*. The anterior nerves are short and they supply the rostellum and suckers. Posteriorly five pairs of nerves arise. They run backwards through the entire length of the body. At the posterior end of each proglottid, the nerve cords are connected by an *annular commissure*. Tapeworm lacks specialized sense-organs.

Reproductive System

Taenia solium is *hermaphrodite*. Each proglottid has a complete set of *male* and *female* reproductive organs.

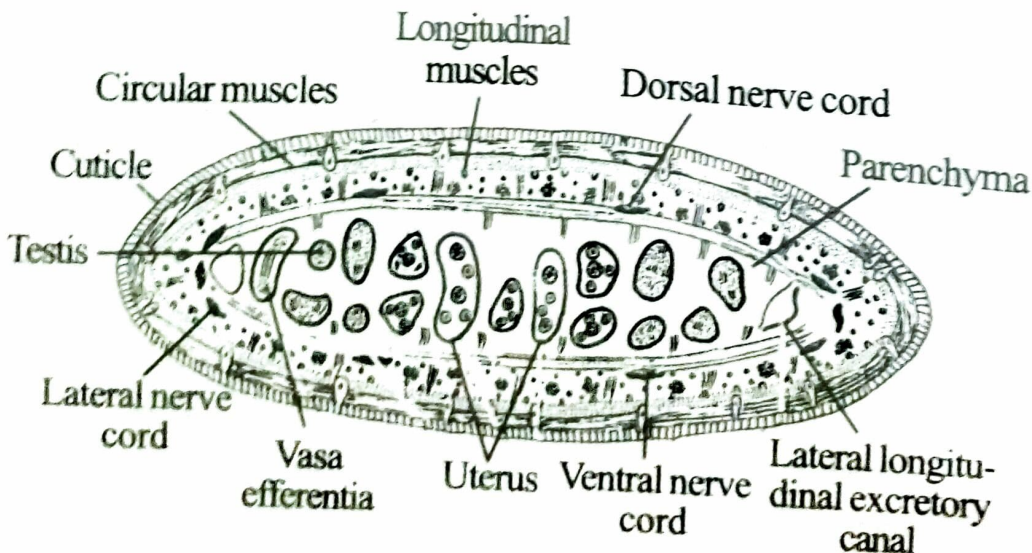


Fig. 7.43: T.S. of *Taenia solium*.

Male Reproductive System

The male reproductive system consists of numerous small rounded *testes* which are scattered through out the proglottid.

From each testis arises a minute duct, the *vas efferens*. All vasa efferentia unite to form the *vas deferens*.

The vas deferens is a coiled tube which extends towards the lateral margin and opens into the genital atrium through the male genital pore.

The last part of the vas deferens passes through a muscular *penis* or *cirrus*. The cirrus is enclosed inside a *cirrus sac*.

The *genital atrium* is a cup-shaped structure. It lies laterally in the proglottid. The male and female genital apertures open into this atrium. The genital atrium opens out by a common *gonopore*.

Female Reproductive System

The female reproductive system consists of a single bilobed *ovary*. It lies towards the posterior border of the proglottid. The two lobes of the ovary are joined by a *bridge*.

From the bridge, the oviduct arises. It runs posteriorly and divides into two ducts. One leads into the *vagina* and the other one leads into the *uterus* which ends blindly.

The uterus lies in the middle of the proglottid. The uterus of *Taenia* resembles that of *Fasciola*. But it has no external opening. The proximal part of the oviduct which leads into the vagina is called *fertilization canal*. The fertilization canal swells to form the *seminal receptacle* in which the sperms are stored.

After the formation of the seminal receptacle, the vagina narrows and opens into the *genital atrium* through the *female genital pore*. There is a *vitellarium* or *vitelline gland* lying behind the ovary. A vitelline duct arises from it and it leads into the fertilization canal. Many unicellular *Mehli's glands* or *shell glands* are present around the *ootype*. The shell glands release their secretion into the oviduct.

Copulation

During copulation, sperms are passed by penis into the vagina. Then the sperms reach

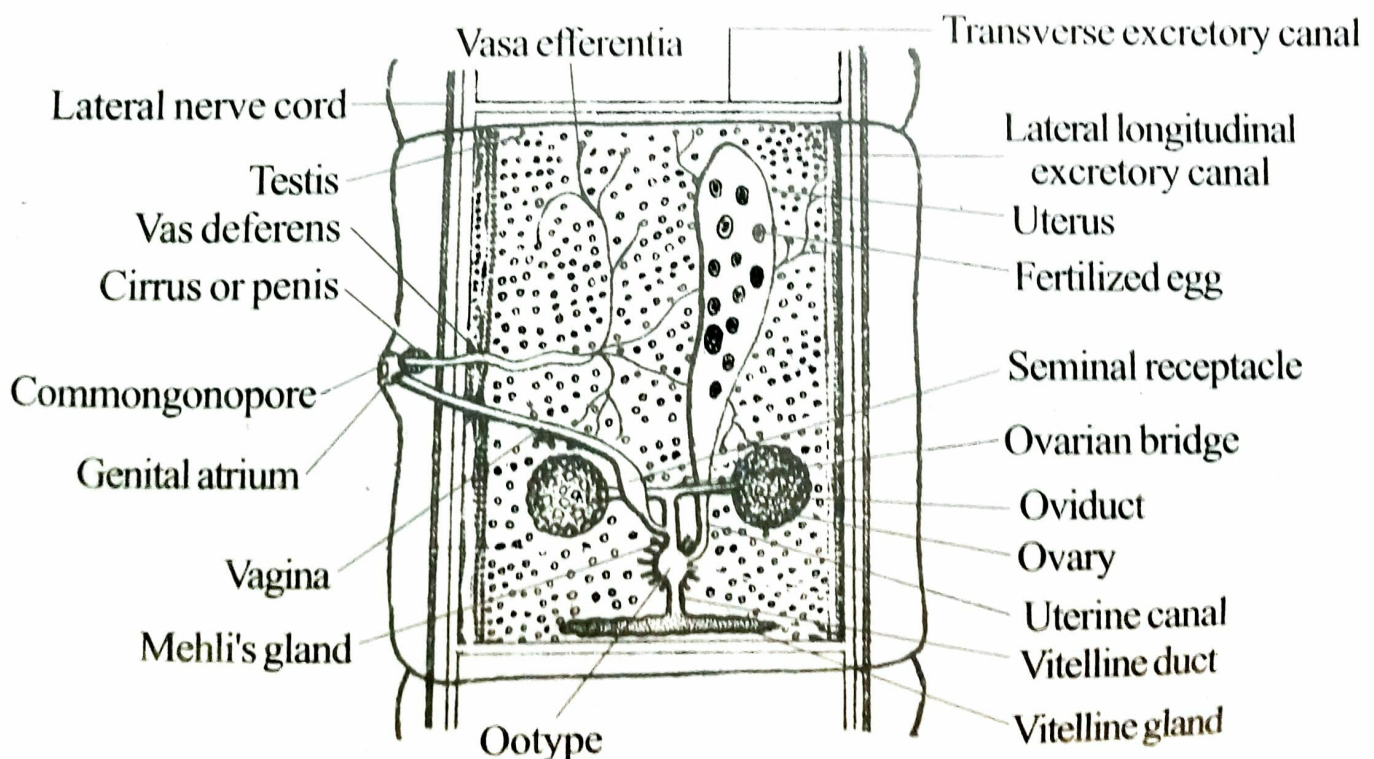


Fig 7.44: Reproductive organs in a mature proglottid.